



E0 251 Aug 3:1

Data Structures and Algorithms

Instructor

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Teaching Assistant

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Department: Computer Science and Automation

Course Time: Tue, Thur 9:30-11am

Lecture venue: Room 252, CSA

Detailed Course Page: <https://drona.csa.iisc.ernet.in/~gsat/Course/DSA/>

Announcements

Brief description of the course

The course is intended for postgraduate students in non-computer science departments who would like to learn data structures and algorithms. It would be helpful if the student has taken an undergraduate level course on data structures/algorithms/programming during their bachelors degree. The course covers the below topics with mathematical rigor.

The course reviews basic data structures like arrays, linked Lists, stacks and queues. Then, it covers heap and binary search tree data structures. Algorithm design techniques like divide and conquer, greedy, dynamic programming are covered using few illustrative problems. Algorithms for graph problems are then covered. Lower bounds and NP-completeness is then covered. The last part of the course overviews advanced data structures and algorithms. Union-Find, splay trees, hashing data structures are covered. Finally, randomized and approximation algorithms are covered.

Prerequisites

None

Syllabus

Review of Basic Data Structures - Arrays, Linked Lists, Stacks, Queues

Standard Data Structures - Heaps, Balanced Search Trees

Algorithmic Paradigms - Divide and Conquer, Greedy, Dynamic Programming

Graph Algorithms - Traversals, Shortest Paths, MST

Lower bounds, Reductions, NP Completeness

Advanced Data Structures - Union Find, Hashing, Splay Trees

Advanced Algorithms - Randomized Algorithms, Approximation Algorithms

Course outcomes

After taking this course, a student would

- 1) Have a good knowledge of heap, search tree data structures
- 2) Apply these data structures for solving other problems
- 3) Have a understanding of various algorithm design techniques
- 4) Design algorithms for new problems using these techniques
- 5) Have a high level understanding and exposure to advanced topics in data structures and algorithms
- 6) Be able to implement the studied data structures and algorithms in a high level programming language

Grading policy

30% for Assignments

30% for Mid-term Exam

40% for Final Exam

Assignments

Resources

Textbook

Data Structure and Algorithm Analysis in C by Mark Allen Weiss

Algorithm Design by Kleinberg and Tardos

Lecture Notes